OHIO RIVER BASIN
TRIBUTARY TO LITTLE DEER CREEK
ALLEGHENY COUNTY

LEVEL II

PENNSYLVANIA

NDI No. PA 00839

PENN DER No. 2-52

RUSSELLTON SLURRY POND 3

REPUBLIC STEEL CORPORATION

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY

ACKENHEIL & ASSOCIATES GEO SYSTEMS, INC.
CONSULTING ENGINEERS
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JULY 1981

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NDI NO. PA 00839
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DACW31-81-C-0027

Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Prepared by: ACKENHEIL & ASSOCIATES GEO SYSTEMS, INC.
Consulting Engineers
1000 Banksville Road
Pittsburgh, Pennsylvania 15216

Date: July 1981

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigations and analyses involving topographic mapping, subsurface investigations, materials testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some time in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Design Flood is based on the estimated "Probable Maximum Flood" (PMF) for the region (greatest reasonably possible storm runoff), or fractions thereof. The Spillway Design Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS

NAME OF DAM:	Russellton Slurry Pond 3
STATE LOCATION:	Pennsylvania
COUNTY LOCATION:	Allegheny
STREAM:	Unnamed tributary to Little Deer Creek
DATE OF INSPECTION:	27 May 1981
COORDINATES:	Lat. 40°35'59" Long. 79°50'22"

ASSESSMENT

Based on a review of available information, visual observations of conditions as they existed on the date of the field inspection, and supporting engineering calculations, the general condition of the Russellton Slurry Pond 3 is considered to be fair.

This assessment is based primarily on visual observations of the embankment, spillway and seepage conditions and hydrology/hydraulic analyses of reservoir/spillway capacity.

The structure is classified as a "large" size, "high" hazard structure. Corps of Engineers guidelines recommend the Probable Maximum Flood (PMF) as the Spillway Design Flood for a "large" size, "high" hazard dam. Pond 3's Spillway Design Flood is the Probable Maximum Flood. Spillway capacity is "adequate" because the non-overtopping flood discharge was found, by using the HEC-1 computer program, to be in excess of 100 percent of the PMF.

The Phase I investigation of Pond 3 revealed deficiencies and conditions which should be corrected or improved through implementation of the following recommended remedial, monitoring and/or improvement efforts.

RECOMMENDATIONS

1. Embankment Improvements: The owner should immmediately develop and implement a plan for improving surface drainage and providing erosion control to:

   a. Halt the further degradation of the embankment.

   b. Remove low spots and depressions that can impound surface water.

2. Spillway Improvements: The owner should immediately:

a. Construct and install an adequate debris control structure for the spillway inlet.

b. Locate, clean and maintain an effective spillway outlet structure.

c. Develop additional information on the line and grade of the principal spillway conduit and install, if possible, an upstream flow control device. If not possible, prepare an acceptable plan for monitoring continual use or abandoning the facility.

d. Develop additional information on the line and grade of the 24 inch diameter concrete pipe structure whose inlet was observed along the shoreline of the impoundment. Conduit, outlet, and flow control conditions should be evaluated.

e. Clean the inlet and outlet channels of the diversion ditch culvert and repair deformations in the CMP or replace as required.

3. Emergency Operation and Warning Plan: The owner should develop an Emergency Operation and Warning Plan including:

a. Guidelines for evaluating inflow during periods of heavy precipitation or runoff.

b. Procedures for around-the-clock surveillance during periods of heavy precipitation or runoff.

c. Procedures for rapid drawdown of the reservoir under emergency conditions.

d. Procedures for notifying downstream residents and public officials, in case evacuation of downstream areas is necessary.

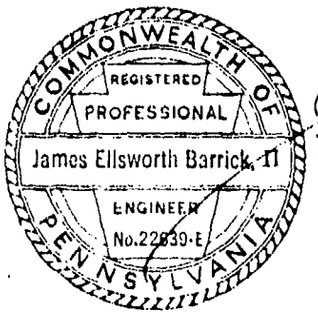
4. Monitoring of Seepage Zones: The seepage zones in the downstream channel should be monitored for changes in water quality and quantity. If one does not now exist, the owner should develop and implement a regularly scheduled monitoring program with appropriate records to indicate possible long-term changes in seepage conditions.

5. Maintenance and Inspection Procedures: The owner should develop written maintenance and inspection procedures in the form of checklists and step-by-step instructions.

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS (CONT'D)
Russellton Slurry Pond 3

Samuel G. Mazzella 17 June 1981
Samuel G. Mazzella Date
Project Engineer

17 June 1981
James P. Hannan Date
Project Engineer

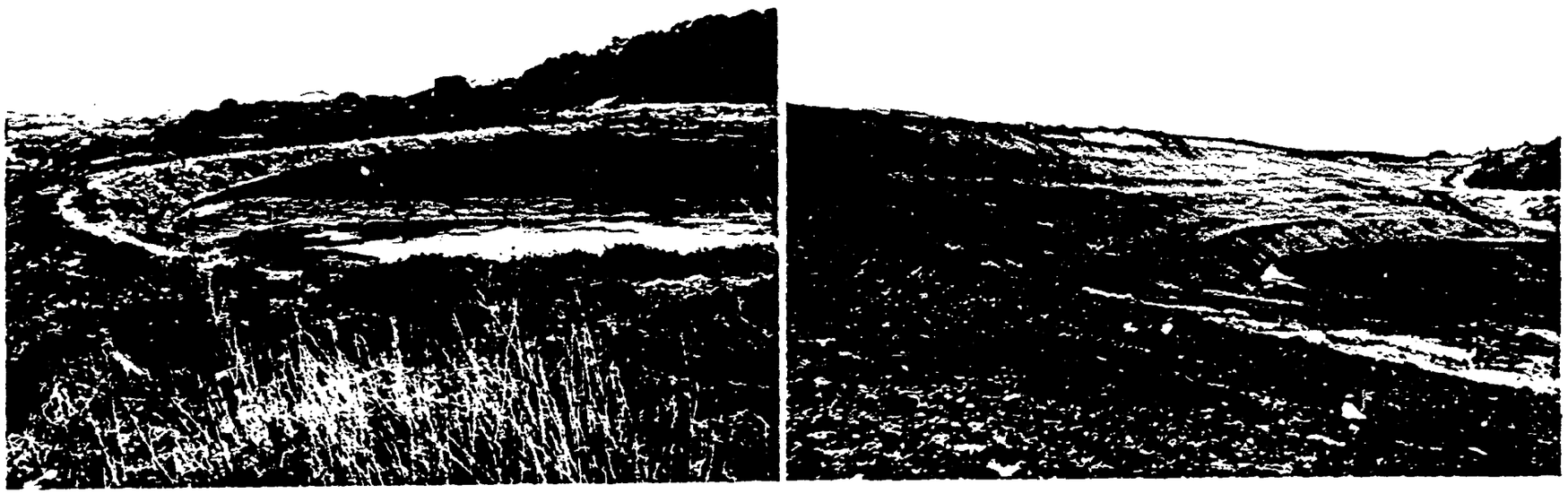


17 June 1981
James E. Barrick, P.E. Date
PA Registration No. 022639-E

Approved by:
JAMES W. PECK
Colonel, Corps of Engineers
Commander and District Engineer

11 Aug 81
Date

RUSSELLTON SLURRY POND 3



OVERVIEWS

TABLE OF CONTENTS

TABLE OF CONTENTS (cont'd)

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
RUSSELLTON SLURRY POND 3
NATIONAL I. D. NO. PA 00839
PennDER No. 2-52

SECTION 1
PROJECT INFORMATION

1.1 GENERAL

a. Authority: The Phase I investigation was performed pursuant to authority granted by Public Law 92-367 (National Dam Inspection Act) to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose: The purpose of the investigation is to make a determination on whether or not the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Dam and Appurtenances:

(1) Embankment: Russellton Slurry Pond 3 impounding embankment is constructed of earth and coarse coal refuse. The embankment is 860 feet long, with a toe to crest height of about 153 feet. The embankment's upstream slope was observed to be 1.9H:1V above the slurry line; the downstream slope was observed to be locally steep but was 4.9H:1V over the entire slope.

(2) Principal Spillway: The principal spillway is a 6 inch diameter steel pipe with drop inlet structure located along the right shoreline about halfway up the reservoir. The pipe reportedly discharges below the downstream toe of the embankment.

(3) Emergency Spillway: Pond 3 does not have a formal emergency spillway. However, a diversion ditch culvert (18 inch diameter CMP) at the right abutment would perform as an emergency spillway in the event of significant inflows to the pond.

(4) Other Outlet: A 24 inch diameter concrete pipe was observed just upstream of the right end of the embankment. However, its purpose and outlet location are unknown.

(5) Freeboard Conditions: Freeboard between the principal spillway inlet and the minimum height of the dam is 7.9 feet.

(6) Downstream Conditions: The channel below the toe of Russellton Slurry Pond 3 passes through a narrow valley between massive deposits of coarse coal refuse. Near the lower end, the channel enters several small settling and water treatment ponds that are used to improve the quality of spring flows and principal spillway discharges. About 3,000 feet below the dam, the unnamed creek flows into Little Deer Creek. Little Deer Creek flows for about 3.5 miles to its confluence with Deer Creek in Indiana Township. Deer Creek flows another 2 miles to the Allegheny River near Harmarville, Pennsylvania.

(7) Reservoir: The Russellton Slurry Pond 3 is about 1550 feet long at the normal pool elevation and has a surface area of 26 acres. When the pool is at the crest of the dam, the reservoir length increases to 1630 feet and the surface area is 27.2 acres.

(8) Watershed: The watershed contributing to Russelton Slurry Pond 3 is vegetated by woodland, grassland, and coarse coal refuse deposits. The watershed is reported to be completely owned by the Republic Steel Corporation.

b. Location: Russellton Slurry Pond 3 is located across an unnamed tributary to Little Deer Creek in West Deer and Indiana Townships, Allegheny County, Pennsylvania, approximately one mile south of Russellton, Pennsylvania.

c. Size Classification: The dam has a maximum storage capacity of 826 acre-feet and a toe to crest height of 153 feet. Based on the Corps of Engineers guidelines, this dam is classified as a "large" size structure.

d. Hazard Classification: Russellton Slurry Pond 3 is classified as a "high" hazard dam. In the event of a dam failure, two inhabited dwellings, Russellton Road, and Russellton No. 2 Mine and Preparation Plant lie on the floodplain at elevations low enough to possibly be subjected to substantial damage and loss of more than a few lives could result.

e. Ownership: Russellton Slurry Pond 3 is owned by the Republic Steel Corporation, Coal Mining Division, Meadow Lands, Pennsylvania. Correspondence can be addressed to:

Republic Steel Corporation
Coal Mining Division
455 Race Track Road
P.O. Box 500
Meadow Lands, Pennsylvania 15347
Attention: Mr. M. D. Farrell
(412) 228-8400

f. Purpose of Dam: Russellton Slurry Pond 3 was constructed and is currently used as a holding and settling impoundment for fine coal refuse sediments from the nearby Russellton No. 2 Mine and Preparation Plant.

g. Design and Construction History: The dam was designed by the staff of Republic Steel Corporation in 1965 and was constructed by DeBaldo Brothers, Inc., of Glenshaw, Pennsylvania, in 1967. The embankment crest was raised in 1978 by Solomon and Teslovich, Inc., of Masontown, Pennsylvania.

h. Normal Operating Procedure: The Russellton Slurry Pond 3 was designed to operate as an uncontrolled structure. Under normal conditions, fine coal refuse slurry from the Russellton No. 2 Preparation Plant is discharged hydraulically to the impoundment zone. Pool level is maintained by the principal spillway inlet, and spillway flows are returned to the plant for reuse in the coal cleaning process.

1.3 PERTINENT DATA

a. Drainage Area	0.15 sq. mi.
b. Discharge	
Maximum Flood at Dam Facility	Unknown
Principal Spillway Capacity at Top of Dam	Negligible
c. Elevation (feet above MSL)*	
Design Top of Dam	Unknown
Current Top of Dam (low point)	1108.3
Diversion Ditch Culvert Inlet (Emergency Spillway)	1101.7
Normal Pool	1100.4
Principal Spillway Inlet Crest	1100.4
Pool at Time of Inspection	1099.3
Maximum Tailwater	Unknown
Principal Spillway Outlet Invert	Unknown
Toe of Impounding Embankment	955±
d. Reservoir Length	
Maximum Pool	1630 feet
Normal Pool	1550 feet

*Datum for field measurements, 1096.0 at base of coal refuse loadout tower, as per owner's topographic map (Plate II).

e. Reservoir Storage

Design Top of Dam	Unknown
Current Top of Dam	826 acre-feet
Normal Pool	606 acre-feet
Principal Spillway Inlet	606 acre-feet
Pool Time of Inspection	1093.3

f. Reservoir Surface

Current Top of Dam	27.2 acres
Normal Pool	26 acres
Principal Spillway Inlet	26 acres

g. Embankment

Type	Earth and Coarse Coal Refuse
Length	860 feet
Height	153 feet
Crest Width	10 feet
Slopes	
Downstream (Overall)	4.9H:1V
Upstream	1.9H:1V
Impervious core	Unknown
Cutoff Provisions	Unknown
Grout Curtain	Unknown

h. Principal Spillway

Conduit	6 inch Diameter Steel Pipe
Inlet	90°Elbow Riser
Trash Screen	Yes
Conduit Length	Unknown
Upstream Flow Control	No
Anti-Seep Collars	Unknown

i. Emergency Spillway (Diversion Ditch Culvert)

Type	18 inch CMP
Location	Right Abutment
Length	40 feet
Trash Screen	No
Anti-Seep Collars	Unknown

SECTION 2
ENGINEERING DATA

2.1 DESIGN

a. Design History: The Russellton Slurry Pond 3 was designed by the engineering staff of the Republic Steel Corporation in 1965. No other information was available concerning the design of this structure.

b. Data Available: Data available for review included:

(1) The contents of the Pennsylvania Department of Environmental Resources files, consisting of dam data and location information.

(2) A topographic map prepared by L. Robert Kimball and Associates that was provided by the owner.

(3) Discussions with a company representative during the performance of the Russellton Slurry Pond 3 field inspection.

2.2 CONSTRUCTION

a. Contractor: The impounding embankment was originally constructed by DeBaldo Brothers, Inc., of Glenshaw, Pennsylvania, in 1967.

b. Modification: The embankment crest was raised ten feet in the spring of 1978. The modification was constructed by Solomon and Teslovich, Inc., of Masontown, Pennsylvania.

2.3 OPERATION

The dam and impoundment are designed to operate without a dam tender.

The principal spillway inlet is uncontrolled and maintains the reservoir normal pool at Elevation 1100.4. The spillway discharges to several settling/treatment ponds below the dam via the downstream channel. The water is then returned to the preparation plant for reuse in the coal cleaning process.

2.4 EMERGENCY SPILLWAY

There is no formal emergency spillway for Pond 3. However, an 18 inch diameter CMP diversion ditch culvert at the right abutment would function as an emergency release for large storm inflows.

2.5 EVALUATION

a. Availability: Available information was obtained from the Pennsylvania Department of Environmental Resources and was supplemented by drawings received from and conversations with a representative of Republic Steel Corporation, the Owner.

b. Adequacy: The available information, supplemented by field inspection and supporting engineering analyses presented in succeeding sections, is adequate for the purpose of this Phase I Inspection Report.

c. Validity: There appears to be no reason to question the validity of the available information and drawings.

SECTION 3
VISUAL INSPECTION

3.1 FINDINGS

a. General: The field inspection of Russellton Slurry Pond 3 was performed on 27 May 1981 and consisted of:

(1) Visual observations of the embankment crest and slopes, groins and abutments.

(2) Visual observations of the principal spillway and other outlet facilities.

(3) Visual observations of the embankment's downstream toe area, including drainage channels and surficial conditions.

(4) Transit stadia field measurements of relative elevations along the embankment crest and slopes.

(5) Visual observations of the reservoir shoreline and watershed.

(6) Visual observations of downstream conditions and evaluation of downstream hazard potential.

The visual observations and measurements were made during periods when the reservoir and tailwater were at normal operating levels.

The visual observations checklist, field sketches, and field section including the observations and comments of the field inspection team are contained in Appendix A. Specific observations are illustrated on photographs in Appendix C. Detailed findings of the field inspection are presented in the following section.

b. Dam Configuration: The embankment that forms Russellton Slurry Pond 3 is an extensive deposit of coarse coal refuse materials placed across the valley of an unnamed tributary to Little Deer Creek to form an impounding embankment of considerable height.

An earthen dike consisting of soil and small rock materials has been placed at the crest of the embankment to form the upper most portion of the impounding structure.

The principal spillway consists of a 6 inch diameter (nominal) steel pipe with a drop inlet structure located along the left shoreline about halfway up the reservoir.

No emergency spillway was observed.

c. Embankment:

(1) Crest: The crest of Pond 3's embankment was generally even, vertically. The crest curves horizontally, being convex downstream and having a central angle of approximately 120°.

The crest was partially vegetated by grass, clover and small brush. Numerous barren spots were observed but there were no depressions or wheel ruts and there was no indication of standing water anywhere on the embankment crest. Some randomly oriented drying cracks were observed.

(2) Upstream Slope: The upstream face of the embankment was generally uniform from crest to sediment and from abutment to abutment but contained some local irregularities. The slope was measured to be approximately 1.9 H:1V.

The upstream slope was sparsely vegetated by grass, clover and small brush. Numerous barren spots were observed.

There were no indications of significant erosion or instability of the upstream slope.

(3) Downstream Slope: The downstream slope of the embankment consisted of a massive, unvegetated, irregular deposit of coarse coal refuse materials. The limits of the embankment were difficult to define because of the irregularity of the deposits. Numerous access and haul roads traverse the downstream slope.

Considerable erosion of the downstream slope has taken place as a result of surface runoff. Several deep gullies were observed that appeared to be local drainage channels. Sediment deposits resulting from embankment erosion were observed at several places. In general, the erosion, though significant in some places, did not appear to pose a threat to the embankment in terms of undercutting of slopes and erosion of embankment support.

The embankment's downstream slope varied from very steep locally, to mild in the overall general dimension. No cracks, scarps, bulges or other signs of significant slope instability were observed anywhere on the embankment's downstream slope.

A much older deposit of coarse coal refuse material was observed at or below the embankment's downstream toe along the right edge of the valley. This material appeared to have been burned in the past, resulting in a material known as "reddog". The more recent deposits that comprise the major portion of the impounding embankment did not appear to have burned.

(4) Seepage: No seepage was observed on or about the impounding portion of the embankment.

A major seepage zone was observed in the downstream channel approximately 1,500 feet below the crest of the embankment. Several springs discharging up to 20 to 25 gpm were flowing approximately at the interface of the coarse coal refuse and the original ground surface. Considerable iron staining and some algae growth were observed immediately below the spring discharge points. Approximately 100 feet below, the spring flows entered a small depression that provided a sedimentation basin for channel flows. Considerable very fine, soft sediments were observed on the bottom of the depression. The origin of these materials could not be determined. Inflow to the sediment basin was generally clear, and discharge from the pond area was estimated at between 40 and 50 gallons per minute.

d. Abutments:

(1) Right: The right abutment of the embankment was generally mild to steep and ranged from barren to tree covered. Some erosion of abutment slopes has occurred where drainage channels and borrow areas have been excavated.

There were no indications of significant instability anywhere on the right abutment slope.

(2) Left: The location of the junction of the embankment with the left abutment could not be determined because the coarse coal refuse deposit extends far into the valley to the left of the impounding embankment. Current coarse refuse disposal operations are centered in this left valley.

A linear depression was observed on the left abutment and left portion of the embankment slope that contained sediments and evidence of recent standing water.

e. Principal Spillway:

(1) Intake: On the date of inspection, the screen covering the principal spillway intake was partially clogged with vegetal debris. The crest of the inlet was located 1 to 1.5 feet above the pool level.

(2) Conduit: The principal spillway conduit was observed only at and above the reservoir water level. The conduit is 6 inch diameter (nominal) steel pipe which contained some surficial rust. The owner's representative indicated that when the plant is operating, the conduit functions properly.

No other observations of the condition or capacity of the conduit could be made. There was no indication of the existence of an upstream flow control device, and the outlet downstream was not found.

f. Outlet Facilities:

(1) Diversion Ditch Culvert: The 18 inch diameter corrugated metal pipe diverison ditch culvert at the right end of the embankment was damaged and deformed at both the inlet and outlet end. Some brush and minor debris covered the entrance to the culvert.

(2) Concrete Pipe: A 24 inch diameter concrete pipe located just upstream of the right end of the embankment was unobstructed on the date of inspection. No debris was observed on the perforated steel plate covering the opening.

The location and condition of the pipe's outlet was not observed.

g. Reservoir:

(1) Slopes: The slopes above the reservoir shoreline were generally mild to steep and ranged from bare coarse coal refuse to woodland. Some erosion and disturbance of shoreline slopes was observed but there were no indications of detrimental reservoir sedimentation or shoreline instability.

(2) Sedimentation: The entire downstream portion of the reservoir consisted of a deposit of fine coal refuse sediments that approached to within eight feet of the crest of the embankment. The upper portion of the reservoir contained standing water and the extent of sedimentation there could not be determined.

(3) Inlet Stream: Because of the reservoir's location high in the watershed, there is no defined inlet stream.

Numerous springs and swampy zones were observed near the upper end of the reservoir.

(4) Watershed: The watershed was generally as indicated by the most recent USGS topographic map. There were no indications of significant new construction or mining activities within the watershed. A considerable portion of the watershed to the north consists of a coarse coal refuse disposal embankment. The coal refuse embankment surface was barren to partially vegetated with grass and clover.

In the vicinity of the pond, the watershed is vegetated by grass, weeds and small trees. Considerable barren areas exist in this portion of the watershed. The upper watershed to the ridge line is generally wooded.

h. Downstream Conditions:

(1) Downstream Channel: The downstream channel below the toe of the embankment consists of a narrow valley lying between massive deposits of coarse coal refuse. The previously described springs and seepage zones lie within this reach of the downstream channel. Near the lower end of the coarse refuse deposit, the downstream channel enters several small settling and water treatment ponds that are used to improve the quality of spring flows and principal spillway discharges. Clarified water is collected in the lower ponds and returned to the plant for reuse in the coal preparation process.

(2) Floodplain Development: In the first 3000 feet below the Russellton Slurry Pond 3, two inhabited dwellings, Russellton Road and the Russellton No. 2 Mine and Preparation Plant lie on the floodplain on elevations low enough to possibly be imperiled by high flows.

3.2 EVALUATION

The following evaluations are based on the visual inspection performed on 27 May 1981.

a. Embankment: The condition of Russellton Slurry Pond 3 embankment is considered to be fair. This assessment is based on observed conditions which included:

(1) Considerable erosional activity and sedimentation on the embankment's downstream slope.

(2) Lack of vegetal covering that promotes continued significant erosion.

(3) Lack of a uniform, maintained vegetal cover on the impounding embankment's earthen dike.

(4) A depression on the left abutment and left embankment slope that appeared capable of impounding water that would seep into the embankment.

(5) No observed indications of significant embankment instability, no indications of a high groundwater level or detrimental seepage conditions, and no indication that the observed erosional activity has imperiled the safety or stability of the embankment.

b. Principal Spillway: The condition of the principal spillway is considered to be poor. This assessment is based primarily on an observed inadequate debris control screen at the intake and the apparent lack of an upstream flow control device.

Because the plant was not operating, the operability of the principal spillway could not be determined.

c. Diversion Ditch Culvert (Emergency Spillway): The condition of the diversion ditch culvert was considered to be poor. This assessment is based primarily on the observed deformed and damaged inlet and outlet and the vegetation growing immediately upstream and downstream of the pipe. These conditions would reduce, though not eliminate, discharge capacity of the culvert.

d. Downstream Conditions: The springs and seepage zones observed in the downstream channel approximately 1500 feet below the embankment crest are considered to be a deficiency. The origin of the flows could not be determined but they did not appear to be resulting in active internal erosion of embankment or foundation soil materials.

e. Hazard Potential: The Russellton Slurry Pond 3 was assigned a high hazard potential rating. This is based on observed downstream conditions which included two inhabited dwellings, a major local road and the Russellton No. 2 Mine and Preparation Plant. Should the dam fail, there is a potential for substantial damage and the loss of more than a few lives.

SECTION 4
OPERATIONAL FEATURES

4.1 PROCEDURE

Reservoir pool level is maintained by the overflow crest of the principal spillway. Normal operating procedure does not require a dam tender. No emergency spillway was observed.

4.2 MAINTENANCE OF DAM

The embankment and appurtenances are maintained by the Republic Steel Corporation. Maintenance reportedly consists of periodically repairing eroded and sloughed areas and making miscellaneous repairs as necessary.

4.3 INSPECTION OF DAM

The Republic Steel Corporation is required by the State of Pennsylvania to inspect the dam annually and make needed repairs.

The Republic Steel Corporation is required by the Mining Safety and Health Administration (MSHA) to inspect the dam at least once every seven days and to make an annual report and certification of the dam.

4.4 WARNING PROCEUDRE

There is no warning system and no formal emergency procedure to alert or evacuate downstream residents upon threat of a dam failure.

4.5 EVALUATION

There is no mechanism for upstream closure of the principal spillway conduit and there is no provision for drawdown of the reservoir in the case of an emergency.

The current dam maintenance program should be continued and supplemented to improve surface runoff drainage and erosion control. There are no written operation, maintenance or inspection procedures, nor is there a warning system or fc mal emergency procedure for this dam. These procedures should be developed in the form of checklists and step by step instructions, and should be implemented as necessary.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

a. Design Data: Russelton Slurry Pond 3 has a watershed of 96 acres, consisting mostly of woodland and coarse coal refuse. The watershed is about 0.4 mile long and 0.4 mile wide and has a maximum elevation of 1,310 feet (MSL).

At the principal spillway crest, Elevation 1100.4, the pond has a surface area of 26 acres and a storage capacity of 626 acre-feet. The principal spillway inlet is located along the right shoreline about halfway up the reservoir. A diversion ditch culvert that serves as an emergency spillway is located on the right abutment.

There was no information available concerning the spillway design capacity requirement at the time of this design.

b. Experience Data: Records are not kept of reservoir level or rainfall amounts. There is no record or report of the embankment ever being overtopped.

c. Visual Observations: On the date of the field inspection, the principal and emergency spillway inlets were partially blocked. The pool elevation, at the time of the inspection, was about 9 feet below the crest of the dam.

d. Overtopping Potential: Overtopping potential was investigated through the development of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway. The Corps of Engineers guidelines recommend the Probable Maximum Flood (PMF) for "large" size, "high" hazard dams. Based on the size and hazard classification, the Russellton Slurry Pond 3 has a Spillway Design Flood (SDF) of the PMF.

Hydrometeorological Report No. 33 indicates the adjusted 24 hour Probable Maximum Precipitation (PMP) for the subject site is 19.2 inches. No calculations were found to indicate whether or not the reservoir and spillway are sized to pass a flood corresponding to the runoff from 19.2 inches of rainfall in 24 hours. Consequently, an evaluation of the reservoir/ spillway system was performed to determine whether the dam's spillway capacity is adequate under current Corps of Engineers guidelines.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, Davis, California, July 1978. The major methodologies and key input data for this program are discussed briefly in Appendix D.

The reservoir routing was started at Elevation 1100.4 (spillway crest). The principal and emergency spillway were not included in the analysis due to the possibility that they would be blocked during a major flood event.

The peak inflow to the Russellton Slurry Pond 3 was determined by HEC-1 to be 570 cfs for the SDF (PMF).

e. Spillway Adequacy: The capacity of the reservoir was determined to be in excess of 100 percent of the PMF by HEC-1. According to Corps of Engineers' guidelines, the combined reservoir/spillway capacity of the Russellton Slurry Pond 3 is "adequate."

SECTION 6
STRUCTURAL STABILITY

6.1 AVAILABLE INFORMATION

a. Design and Construction Data: No design documentation and calculations were available for review. The owner provided the drawing that is presented in Appendix B.

b. Operating Records: There are no written operating records or procedures for this dam.

c. Mining Activity: The Upper Freeport Coal Seam lies approximately 400 feet below the dam and impoundment and has been extensively mined. The Pittsburgh Coal Seam outcrops in adjacent hillsides and for the most part, has been removed by surface mining techniques.

d. Visual Observations: The visual inspection disclosed that locally very steep slopes exist on the downstream face of the embankment, but little or no sloughing or slope instability was observed. There were no signs of cracks, scarps, or anomalous bulges. The overall embankment slope is generally moderate to mild, as indicated by Field Section A-A'.

The field inspection disclosed no evidence of a high groundwater level in the embankment.

The only seepage observed was 1500 feet downstream of the crest at the refuse/original ground interface. Though seepage flows were significant (40-50 gpm), there was no evidence of internal erosion (piping) of foundation or embankment materials.

There were no indications of significant instability of the Pond's abutments.

No surficial evidence of mine subsidence was observed in the vicinity of the dam or impoundment.

e. Performance: There has been no indication or report of any problems with the performance of this embankment over its 14 year life.

6.2 EVALUATION

a. Design Documents: No design documents or calculations were available to evaulate the structure.

b. Embankment: Based on results of the visual observation of embankment slopes, materials, and seepage conditions, Russellton Slurry Pond 3 appeared to be stable with respect to sliding stability.

The Pond's impounding embankment has suffered and is continuing to suffer significant erosional degradation. Because of the massive nature of the embankment, such distress has not reached a critical or dangerous stage. The embankment can nevertheless be assessed as unstable with respect to erosional activity.

f. Seismic Stability: According to the Seismic Risk Map of the United States, Russellton Slurry Pond 3 is located in Zone 1 where damage due to earthquakes would most likely be minor.

A dam located in Seismic Zone 1 may be assumed to present no hazard from an earthquake, provided static stability conditions are satisfactory and conventional safety margins exist. No calculations were developed to verify this assessment, however.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT

a. Evaluation:

(1) Embankment: Russellton Slurry Pond 3's embankment is considered to be in fair condition. This is based primarily on visual observations of impounding embankment surficial conditions. There were no indications of significant downstream slope instability and there was no observed high groundwater level in the embankment.

(2) Principal Spillway: The principal spillway is considered to be in poor condition. This assessment is based primarily on results of the field inspection, which revealed an inadequate inlet debris control structure, and no observed conduit upstream flow control. Also, the outlet's location and condition were not examined.

The reservoir's hydrologic/hydraulic caacity was found, by using HEC-1, to be "adequate" by current Corps of Engineers' guidelines.

(3) Diversion Ditch Culvert (Emergency Spillway): Although the diversion ditch culvert is not essential for proper hydrologic/hydraulic performance of the reservoir, the facility, including inlet, conduit, and outlet, is in need of maintenance.

(4) Seepage: The extensive zone of seepage in the downstream channel is considered to be a deficiency. However, there was no evidence of uncontrolled movement or erosion of embankment or foundation soil materials.

(5) Emergency Plans: The lack of a documented emergency operation and warning plan is considered to be a deficiency.

b. Adequacy of Information: The information available on design, construction, operation and performance history in combination with visual observations and hydrology and hydraulic calculations was sufficient to evaluate the embankment and appurtenant structures in accordance with the Phase I investigation guidelines.

c. Necessity for Further Studies: See 7.2b below.

d. Urgency: The recommendations presented in Section 7 should be implemented immediately.

7.2 RECOMMENDATIONS

a. Embankment Improvements: The owner should immediately develop and implement a plan for improving surface drainage and providing erosion control to:

(1) Halt the further degradation of the Russellton Slurry Pond 3 embankment.

(2) Remove low spots and depressions that can impound surface runoff allowing infiltration into the embankment's downstream slope.

b. Spillway Improvements: The owner should immediately:

(1) Construct and install an adequate debris control structure at the spillway inlet.

(2) Locate, clean and maintain an effective spillway outlet structure.

(3) Develop additional information on the line and grade of the principal spillway conduit and install, if possible, an upstream flow control device. If not possible, prepare an acceptable plan for monitoring continued use or abandoning the facility.

(4) Develop additional information on the line and grade of the 24 inch diameter concrete pipe structure whose inlet was observed along the shoreline of the impoundment. Conduit, outlet and flow control conditions should be evaluated.

(5) Clean the inlet and outlet channels of the diversion ditch culvert and repair deformations in the CMP or replace as required.

c. Emergency Operation and Warning Plan: The owner should develop an Emergency Operation and Warning Plan including:

(1) Guidelines for evaluating inflow during periods of heavy precipitation or runoff.

(2) Procedures for rapid drawdown of the reservoir under emergency conditions.

(3) Procedures for around-the-clock surveillance during periods of heavy precipitation or runoff.

(4) Procedures for notifying downstream residents and public officials, in case evacuation of downstream areas is necessary.

d. Monitoring of Seepage Zones: The seepage zones in the downstream channel should be monitored at frequent intervals for changes in water quality and quantity. If one does not now exist, the owner should develop and implement a regularly scheduled monitoring program with appropriate records to indicate possible long-term changes in seepage conditions.

e. Maintenance and Inspection Procedures: The owner should develop written maintenance and inspection procedures in the form of checklists and step-by-step instructions.

APPENDIX A

VISUAL INSPECTION CHECKLIST

VISUAL OBSERVATIONS CHECKLIST I
(NON-MASONRY IMPOUNDING STRUCTURE)

Name of Dam Russellton Slurry Pond 3 County Allegheny State Pennsylvania National ID # PA00839

Type of Dam Earth and coarse coal refuse Hazard Category High

Date of Inspection 27 May 1981 Weather Cloudy, mild, intermittent showers
Temperature 60°F

Pool Elevation at Time of Inspection 1099.3 (MSL)
Tailwater at Time of Inspection None

Inspection Personnel:

J. E. Barrick	Ackenheil & Associates, Project Manager and Hydrologist
J. P. Hannan	Ackenheil & Associates, Geotechnical Engineer
S. G. Mazzella	Ackenheil & Associates, Civil Engineer
M. D. Farrell	Owner's Representative

Recorder J. E. Barrick

GEO Project G80138-L
PennDER I.D. No. 2-52

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Randomly oriented drying cracks noted on embankment crest and slopes.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Considerable erosion due to surface runoff has occurred at numerous locations on the embankment's downstream slope. Most of the erosion is of a minor nature. More significant erosion has occurred at a few locations on the slope and near the abutment where well defined surface drainage channels have developed. Though erosional cuts of several feet were observed at several places on the downstream slope, there was no indication of embankment undercutting or stability distress as a result of the erosional conditions. Some minor erosion of original ground was observed at various locations on both abutments. The erosion observed was generally related to areas of excavation for drainage channels or borrow materials. There were no indications of significant scarps, slough zones or areas of instability observed anywhere on the embankment's downstream slope or abutments.	

EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The crest of the dam was generally level vertically. Horizontally, the embankment's crest is curved (convex in the downstream direction) and has a central angle of approximately 120°. No offsets or indications of misalignment were observed on and along the crest.	
RIPRAP FAILURES	None observed.	
JUNCTION OF EMBANKMENT AND ABUTMENTS	The junction of the embankment and the right abutment was generally irregular as the result of random placement of coarse coal refuse on natural ground. The groin and vicinity contained some vegetation including grass, brush and small trees, as well as numerous unvegetated areas. The upper right groin (within the impoundment zone) contains a drainage channel that discharges through an 18 inch corrugated metal pipe. In the lower reaches, the right groin contains some erosion of natural ground and coarse refuse materials and local deposits of sediment therefrom. The junction of the embankment and the left abutment could not be delinated because of a massive deposit of coarse coal refuse that has been placed in the valley to the left of the impoundment.	

EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SETTLEMENT	None observed.	
DRAINS	None observed.	
ANY NOTICEABLE SEEPAGE	No seepage was observed in the immediate vicinity of the embankment or abutments. A large seepage zone containing several seepage discharge points was observed in the downstream channel approximately 1500 feet below the crest of the embankment. The seepage was observed at the interface of the refuse materials and the original ground surface and was accompanied by considerable iron staining for a significant distance below. The upper most spring was estimated to be discharging 5 to 10 gallons per minute. A second spring immediately downstream was discharging an additional estimated 20 to 25 gallons per minute. Approximately 100 feet below, the stream flow entered a small depression in the ground surface that served as a sediment basin. Soft, very fine soil materials were observed on the bottom of the pond. The origin of these materials could not be determined but did not appear to be the result of significant "piping" activity. Inflow to the pond area was generally clear with no additional evidence of subsurface erosion of soil materials. Discharge from the pond was estimated to be between 40 and 50 gallons per minute.	

EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFICIAL CONDITIONS	The impounding embankment consists of a massive deposit of coarse coal refuse with an earthen dike at the crest. The dike appears to be of recent construction, apparently to increase the impounding capacity of the pond. A load out tower is located on the upper right portion of the embankment, just below the earthen dike. The tower is used to load coarse coal refuse into pans for transport to the current active coarse refuse disposal area in the valley to the left of the impounding embankment. The upstream slope of the embankment consists of fine grained to stoney soil materials which are sparsely vegetated with grass, weeds and small brush. The slope is locally uneven but generally uniform from crest to sediment and from abutment to abutment. The crest of the embankment consisted of similar soil materials vegetated in a similar manner. No significant depressions or indications of standing water were observed anywhere along the length of the crest. The embankment's downstream slope consists of a massive deposit of coarse coal refuse distributed in a relatively random manner down valley for a distance of more than 800 feet. Several access roads traverse the downstream slope and there was little indication of uniformity from crest to toe or abutment to abutment. The downstream slope is entirely unvegetated and contains considerable erosional distress as a result of surface runoff.	

PRINCIPAL SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
INTAKE STRUCTURE	The principal spillway intake structure consists of a 90° elbow with opening upward, attached to a 6 inch diameter steel pipe located along the right edge of the reservoir, approximately midway between the dam and upstream end of the pond. The inlet is protected by a wire mesh screen having 1 inch square openings and a wooden (floating) scum shield. On the date of inspection, debris in the form of leaves, twigs and brush was cleaned from the screen. The pipe and screen had some surficial rust.	
CONDUIT	The principal spillway conduit, as observed near the intake structure, is a 6 inch diameter (nominal) steel pipe that disappears into the reservoir in the direction of the downstream toe of the embankment. The conduit had some surficial rust.	
OUTLET STRUCTURE	None observed.	

OTHER OUTLETS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
DIVERSION DITCH CULVERT	A portion of the perimeter of the reservoir contains a surface runoff diversion ditch whose outlet is through the dam at the right abutment. The outlet consists of an 18 inch diameter corrugated metal pipe that is located beneath the embankment and access roadway. The inlet and outlet ends of the culvert were both deformed and damaged on the date of inspection but appeared to be capable of passing at least a portion of design flows. The inlet invert of the culvert pipe was found to be Elevation 1101.7, which is approximately 1.2 feet above the existing sediment level. In the event of significant inflows to the reservoir, the culvert could be expected to activate and provide overflow relief for the impoundment.	
CONCRETE PIPE SPILLWAY	A 24 inch diameter concrete pipe drop inlet was observed approximately 50 feet upstream of the crest of the embankment at the sediment shoreline. The inlet appeared to consist of a 45° elbow attached to a concrete pipe below, whose alignment was in the direction of the left end of the embankment. The pipe was placed with bell up and was protected by a perforated steel plate having openings approximately 1 inch square The inlet pipe and screen were unobstructed and appeared to be in good structural condition. The outlet end of the pipe was not located.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None observed/recorded.	
WEIRS	None observed.	
PIEZOMETERS	None observed.	
OBSERVATIONS WELLS	None observed.	

RESERVOIR

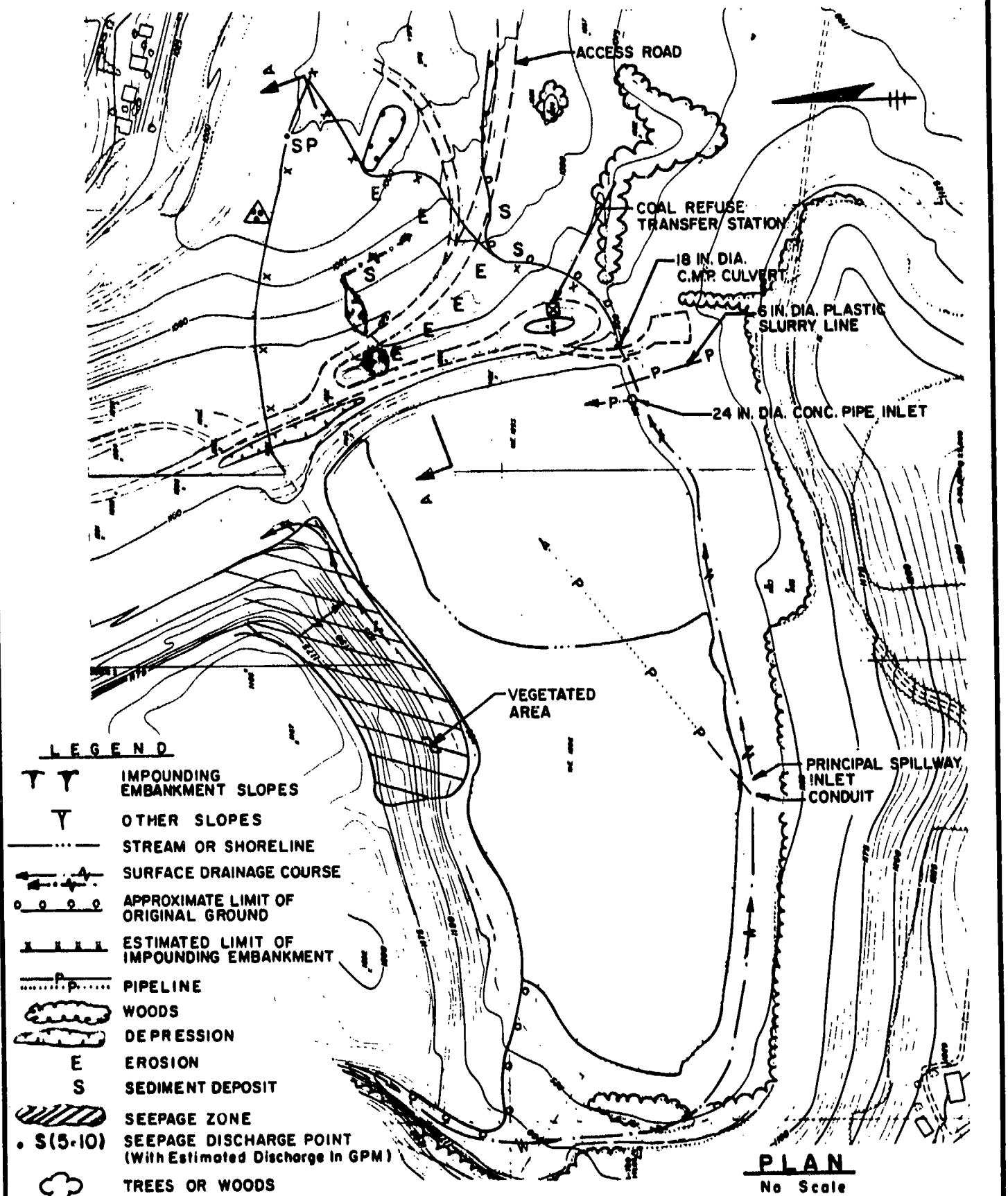
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Shoreline slopes around the perimeter of the reservoir are generally moderate to moderately steep. On the left, the reservoir slopes consist of a massive deposit of coarse coal refuse. The lower portion of these slopes has been vegetated with grass and small brush. The slope contains some local erosion and some sedimentation has occurred. There were no indications of significant slope instability anywhere along the refuse deposit. The upstream end of the reservoir and the right shoreline consist of original ground which is vegetated by grass, brush, and small trees. Some erosion of these slopes has occurred and some sedimentation has resulted at the water line. There were no signs of slope instability anywhere along this portion of the reservoir shoreline.	
SEDIMENTATION	The downstream end of the pond contained a deposit of fine coal refuse sediments that rose to within approximately eight feet of the crest of the embankment. The upstream end of the pond contained standing water and sediment depth could not be estimated.	
INLET STREAM	Because of the location of the impoundment high in the watershed, there is no defined inlet stream.	

RESERVOIR (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
WATERSHED	The watershed was observed to be generally as indicated by the most recent USGS topographic map. No construction or mining activities were observed anywhere within the watershed. The upper watershed to the ridge line is wooded and is reportedly owned by Republic Steel Corporation.	

DOWNSTREAM CHANNEL

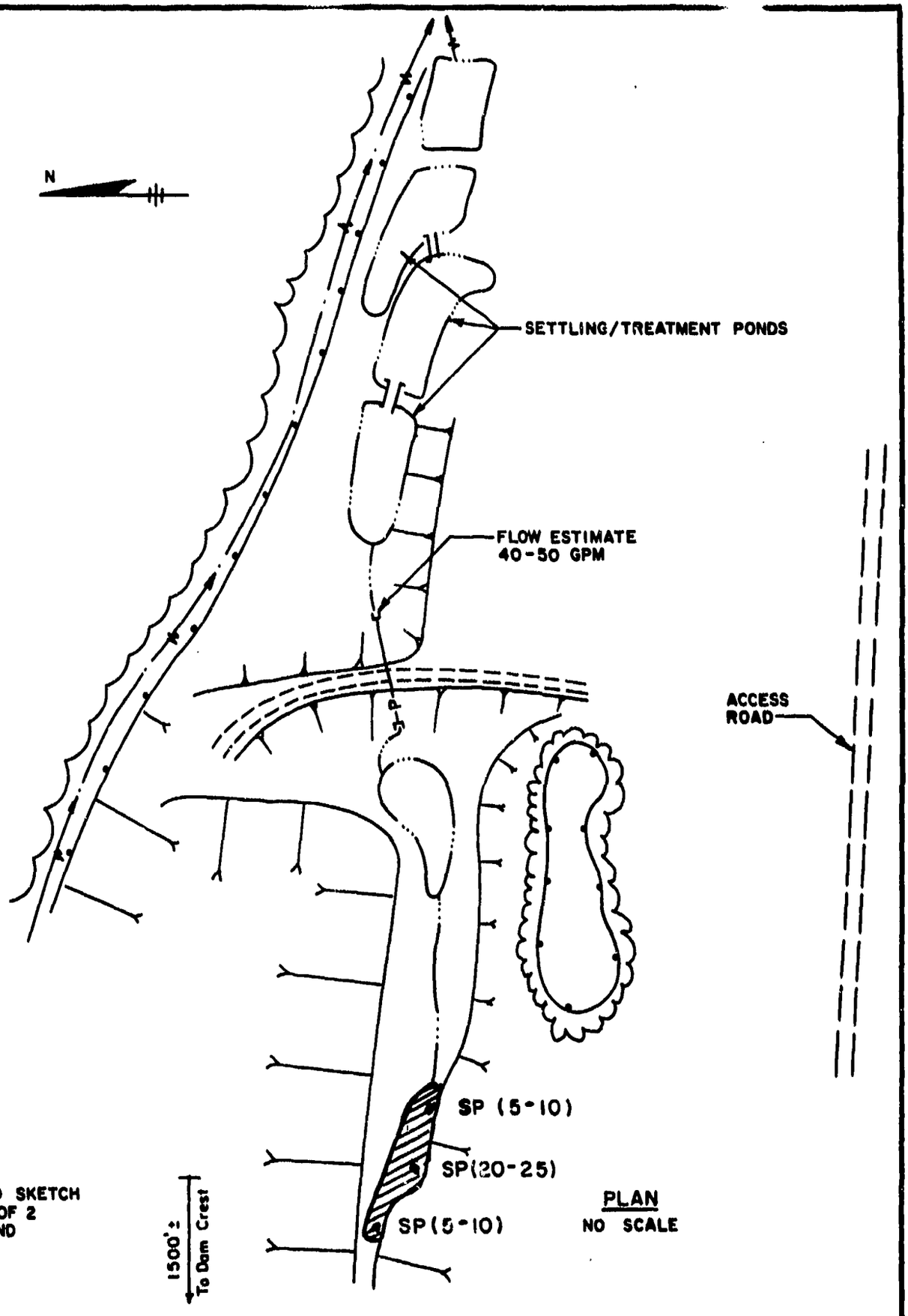
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC).	The downstream channel below the toe of the embankment passes through a narrow, refuse-lined valley on its approach to the large floodplain of Little Deer Creek. A series of small settling/water treatment ponds has been constructed in the reach approximately 2,000 feet below the crest of the embankment. Inflow to these ponds is from the previously described seepage zones and reportedly from the outlet of the principal spillway conduit pipe. The location of the conduit outlet could not be observed. There was no flow in the pipe due to the UMWA work stoppage.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	In the first 2,500 feet below the dam, there are 2 single family dwellings located at elevations low enough to possibly be imperiled by high flows. At approximately 3,000 feet below the dam, the Russellton No. 2 Mine and Preparation Plant lie on the floodplain in the path of potential flood flows.	



PLAN
No Scale

DATE: JULY 1981	RUSSELLTON SLURRY POND 3 NATIONAL DAM INSPECTION PROGRAM	FIELD SKETCH
SCALE: NONE		
DR: JF CK:	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	SHEET 1 of 2
DWG. NO. 80138L-1		

PR 8717-878

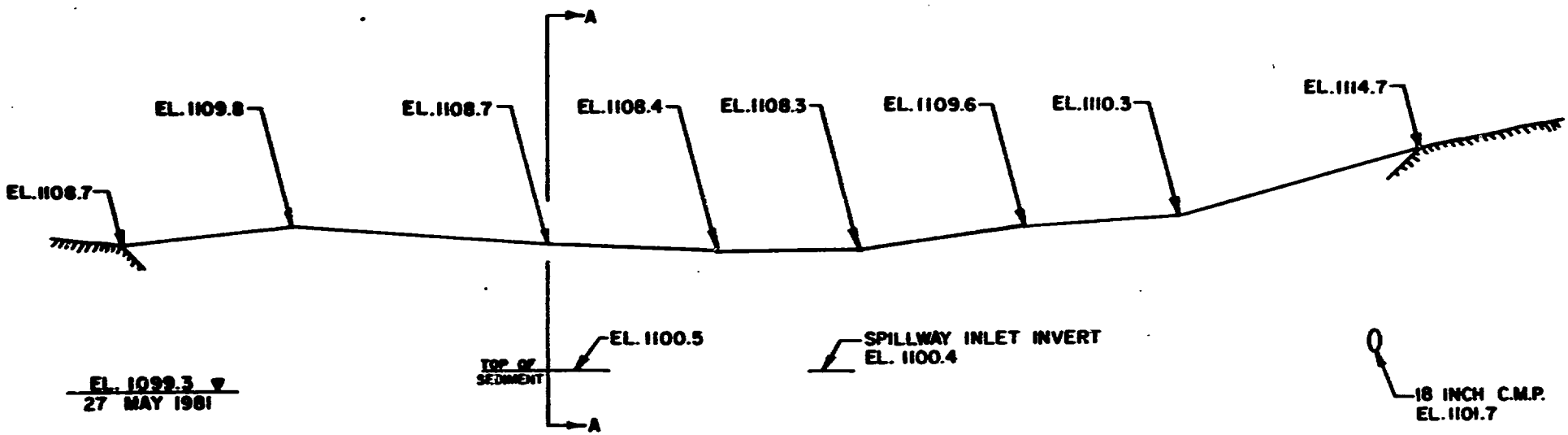


NOTE:
SEE FIELD SKETCH
SHEET 1 OF 2
FOR LEGEND

PLAN
NO SCALE

DATE: JULY 1981		RUSSELLTON SLURRY POND 3 NATIONAL DAM INSPECTION PROGRAM	FIELD SKETCH
SCALE: NONE			
DR: JF	CK: JEB	A. C. ACKENHEIL & ASSOCIATES, INC. CONSULTING ENGINEERS PITTSBURGH, PA., CHARLESTON, W. VA. & BALTIMORE, MD.	SHEET 2 of 2
DWG. NO. 80138L-2			

PR 1124-771



CREST PROFILE

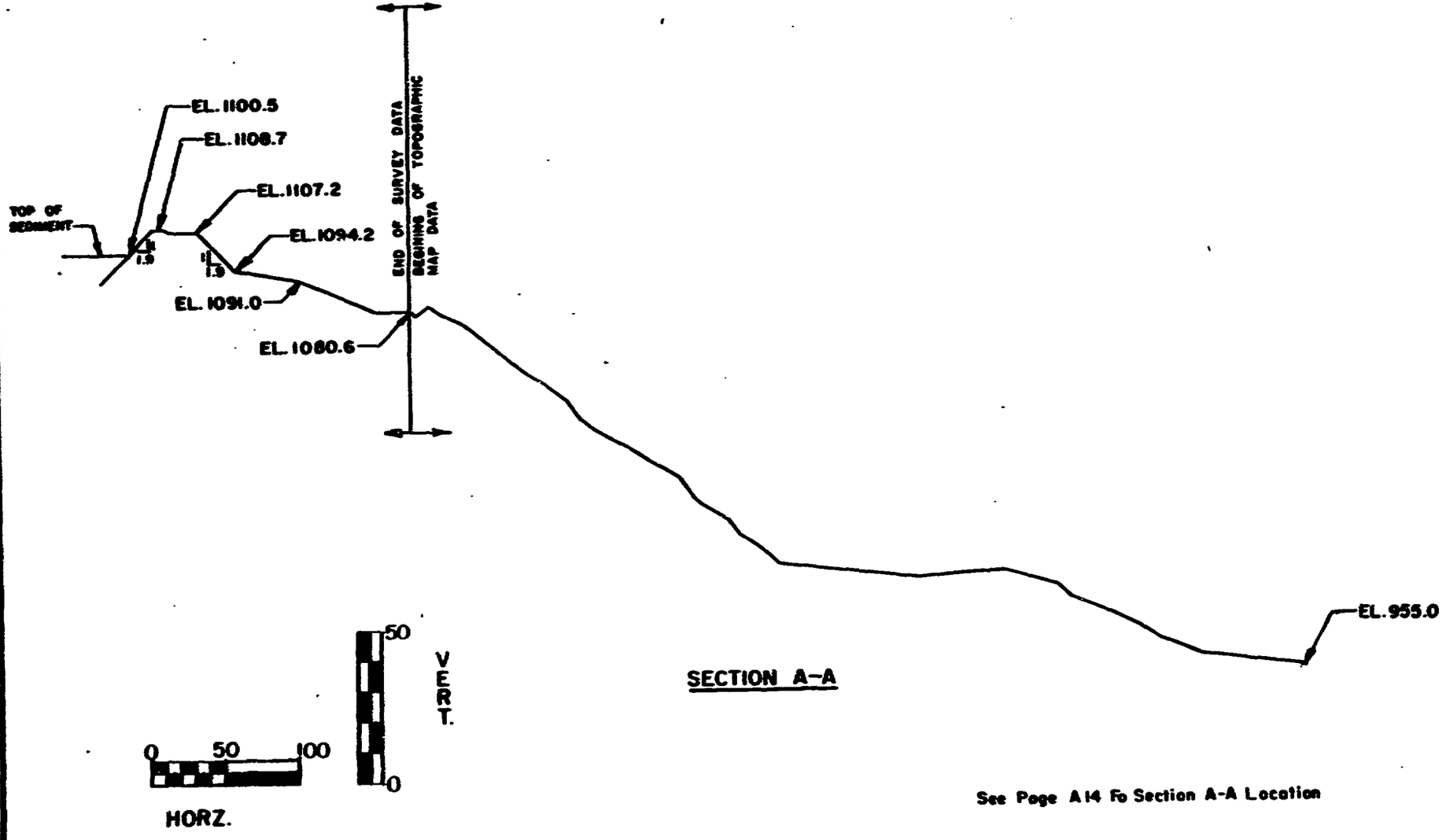
(Looking Down Stream)

SCALE:
HORZ. 1" = 100'
VERT. 1" = 10'

See Page A15 For Section A-A

A14

DATE: JULY 1981	RUSSELLTON SLURRY POND 3 NATIONAL DAM INSPECTION PROGRAM	FIELD PROFILE
SCALE: AS SHOWN		
DR: JF CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	
DWG. NO. 80138L-4		



SECTION A-A

See Page A14 Fo Section A-A Location

DATE: JULY 1981	RUSSELLTON SLURRY POND 3 NATIONAL DAM INSPECTION PROGRAM	FIELD SECTION
SCALE: AS SHOWN		
DR: JF CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	
DWG. NO. 80138 L-3		

APPENDIX B

ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Russellton Slurry Pond 3
NDI No. PA 00839

ITEM	REMARKS
Design Drawings	None available.
*As-Built Drawings	See Topographic Map of Russellton No. 2 Mine; Republic Steel Corporation; May 1976.**
Regional Vicinity Map	USGS 7-1/2 Minute New Kensington West, Pennsylvania Quadrangle Map.
*Construction History	Constructed in 1967 by DeBaldo Brothers Inc. of Glenshaw, Pennsylvania. The breastwork was modified and raised 10 feet in the spring of 1978. The modification was constructed by Solomon and Teslovich, Inc.
Typical Sections of Dam	None available.
Outlets-Plan Details Constraints Discharge Ratings	None available.
Rain/Reservoir Records	None reported.
Design Reports	None available.

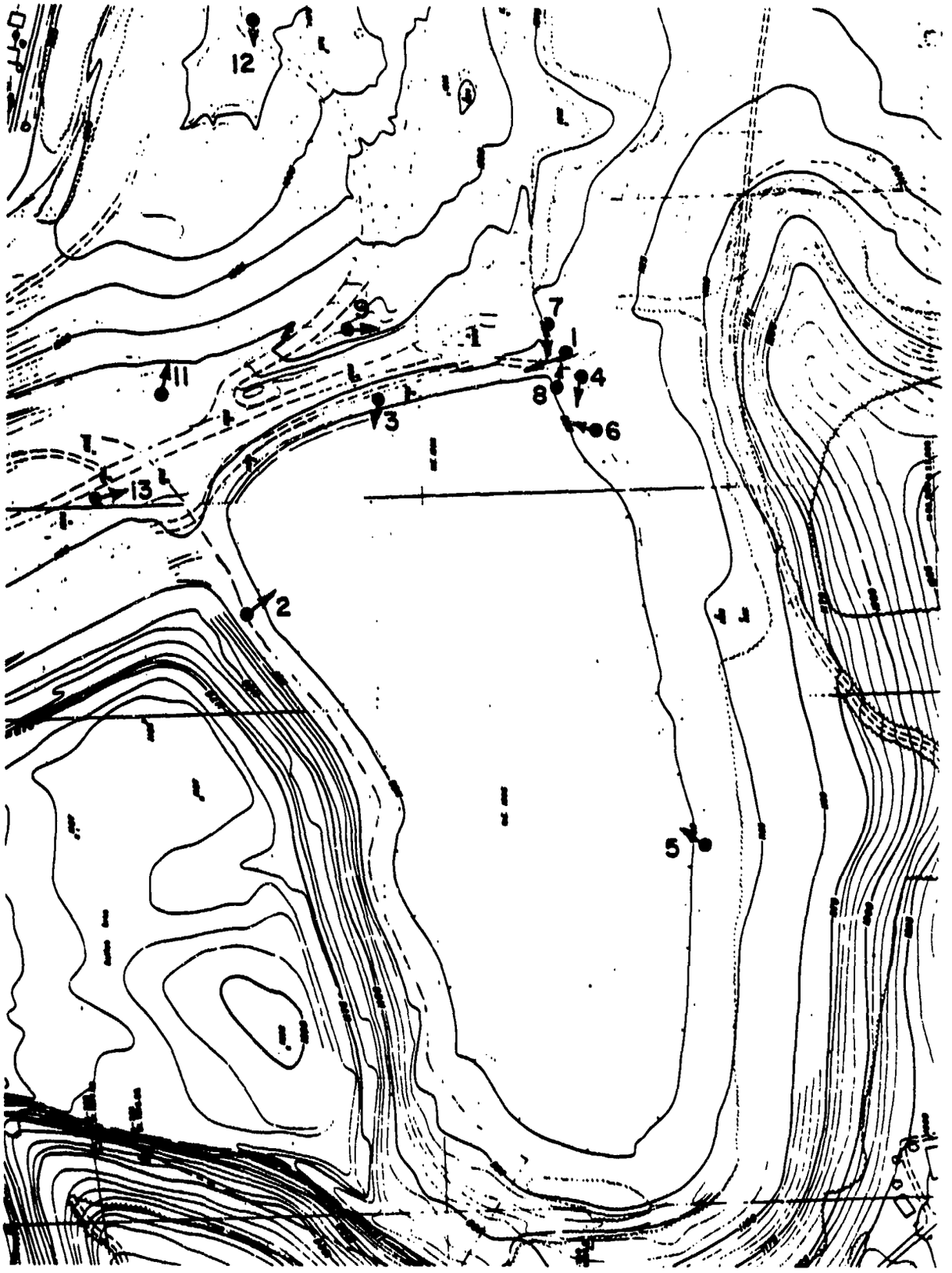
ITEM	REMARKS
Geology Reports	None available.
Design Computations	None available.
Hydrology and Hydraulics	None available.
Dam Stability	None available.
Seepage Studies	None available.
Materials Investigations, Boring Records, Laboratory, Field	None available.
*Post-Construction Surveys of Dam	See As-built Drawings above.
Borrow Sources	Information not available.
Monitoring Systems	None reported.
*Modifications	See Construction History above.
High Pool Records	None available.

ITEM	REMARKS
Post-Construction Engineering Studies and Reports	None available.
Maintenance, Operation, Records	None available.
Spillway-Plan Sections Details	None available.
Operating Equipment Plans and Details	None available.
Specifications	None available.
Miscellaneous	None available.
Prior Accidents or Failure of Dam Description Reports	None reported.

* Map and information provided by Republic Steel Corporation.
**Reduced size reproduction contained in Appendix E.

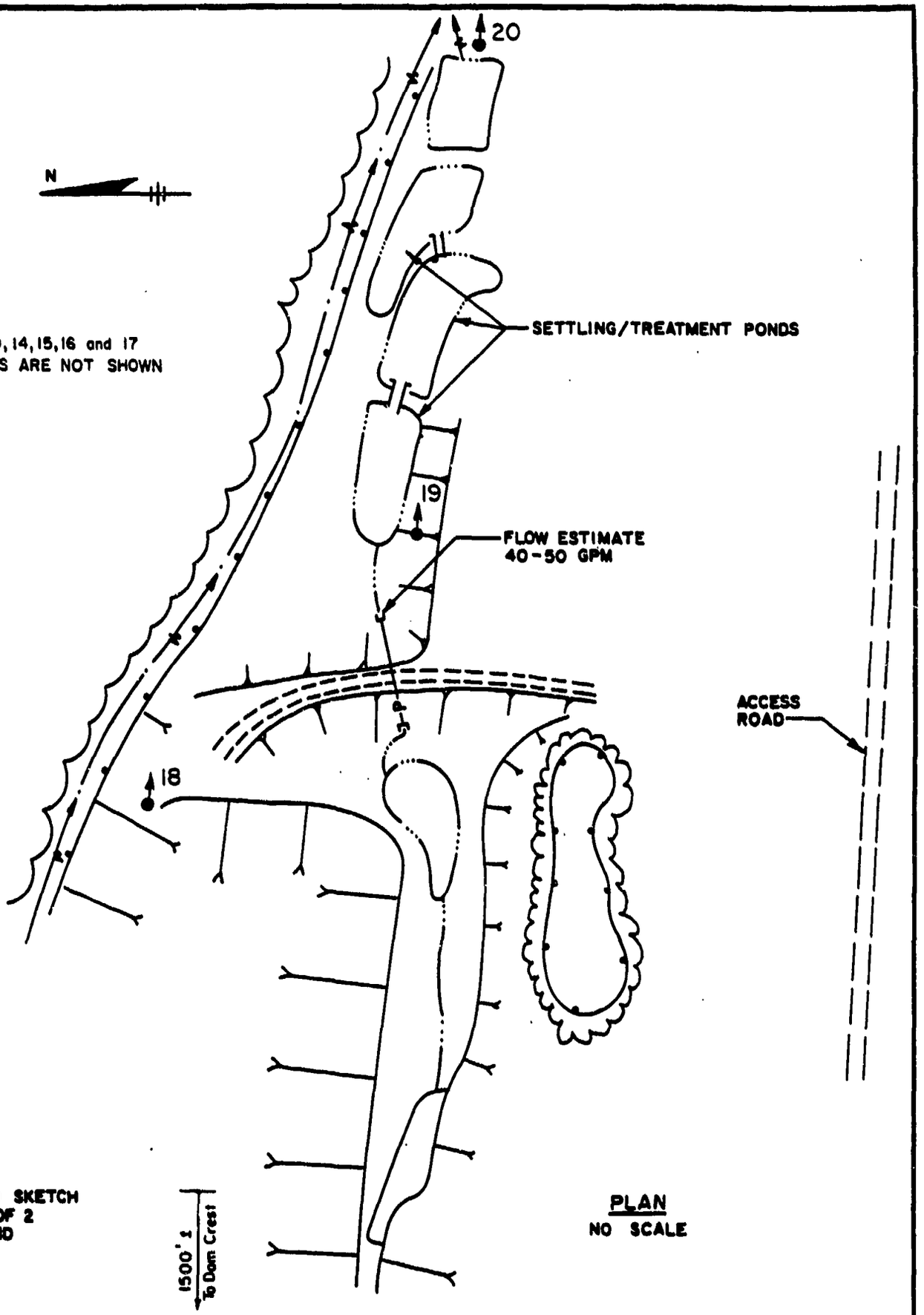
APPENDIX C

PHOTOGRAPHS



PLAN
No Scale

DATE: JULY 1981	RUSSELLTON SLURRY POND 3	PHOTO KEY MAP
SCALE: NONE	NATIONAL DAM INSPECTION PROGRAM	
DR: JF CK:	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS	SHEET 1 of 2
DWG. NO. 80138L	GEO SYSTEMS, INC.	
	1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	

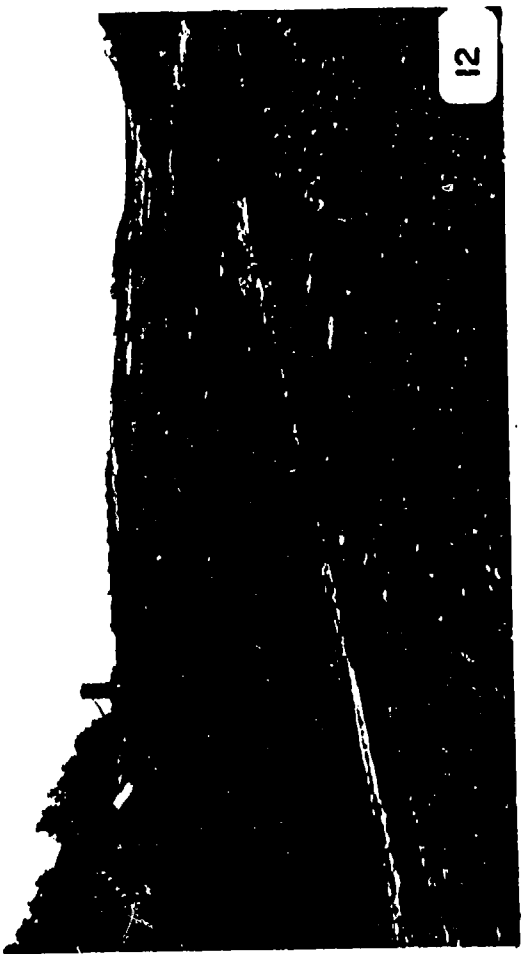


DATE: JULY 1981		RUSSELLTON SLURRY POND 3 NATIONAL DAM INSPECTION PROGRAM	PHOTO KEY MAP
SCALE: NONE			
DR: JF	CK: JEB	A. C. ACKENHEIL & ASSOCIATES, INC. CONSULTING ENGINEERS PITTSBURGH, PA., CHARLESTON, W. VA. & BALTIMORE, MD.	SHEET 2 of 2
DWG. NO. 80138L			

RUSSELLTON SLURRY POND 3

RUSSELLTON SLURRY POND 3

RUSSELLTON SLURRY POND 3



RUSSELLTON SLURRY POND 3

RUSSELLTON SLURRY POND 3

PHOTOGRAPH DESCRIPTIONS

Photo 1 Embankment Crest from right abutment.

Photo 2 Embankment Overview from left abutment.

Photo 3 Left Abutment from crest.

Photo 4 Slurry Inflow Pipe immediately upstream of embankment crest.

Photo 5 Principal Spillway Inlet.

Photo 6 Concrete Pipe Inlet.

Photo 7 Drainage Ditch Culvert (Emergency Spillway) Outlet.

Photo 8 Drainage Ditch Culvert (Emergency Spillway) Inlet.

Photo 9 Downstream Overview showing transfer station and toe of dike crest.

Photo 10 Sediment in right groin from erosion on downstream slope.

Photo 11 Downstream Slope Overview, looking from dike crest.

Photo 12 Downstream Slope Overview from 1000 feet below toe of impounding embankment.

Photo 13 Surface Depression, in upper left abutment and embankment slope.

Photo 14 Downstream Channel through coarse refuse deposits.

Photo 15 Seepage in Downstream Channel.

Photo 16 Seepage in Downstream Channel.

Photo 17 Depression in Downstream Channel with sediment from seepage zone above.

Photo 18 Settling/Treatment Pond.

Photo 19 Settling/Treatment Ponds and Downstream Hazard.

Photo 20 Downstream Hazard.

APPENDIX D

HYDROLOGY AND HYDRAULICS ANALYSES

APPENDIX D
HYDROLOGY AND HYDRAULICS ANALYSES

Methodology: The dam overtopping analysis was accomplished using the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. Precipitation: The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 33" prepared by the U.S. Weather Bureau.

The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. Inflow Hydrograph: The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters, their definition and how they were obtained for these analyses.

Parameter	Definition	Where Obtained
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L'	Length along main stream from centroid of watershed to pond outlet	From USGS 7.5 minute topographic map
Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From USGS 7.5 minute topographic map

3. Routing: Reservoir routing is accomplished by using Modified Puls routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation-discharge relationship.

Storage in the pool area is defined by an area-elevation relationship from which the computer calculates storage. Surface areas are either planimetered from available mapping or USGS 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. Dam Overtopping: Using given percentages of the PMF the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

---

*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Predominately coal refuse, grass, and woodland.

ELEVATION-TOP NORMAL POOL (STORAGE CAPACITY): 1100.4 (606 acre-feet).

ELEVATION-TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1108.3 (826 acre-feet)

ELEVATION-MAXIMUM DESIGN POOL: Unknown

ELEVATION-TOP DAM: 1109.8 (average) 1108.3 (minimum)

PRINCIPAL SPILLWAY

a. Elevation 1100.4
b. Type Steel pipe conduit (6 inch diameter) with 90° elbow drop inlet
c. Location Left reservoir shoreline upstream of dam
d. Gate/Control None

EMERGENCY SPILLWAY (DRAINAGE DITCH CULVERT)

a. Type 18 inch diameter CMP
b. Location At right abutment of embankment
c. Entrance Invert 1101.7
d. Exit Invert Unknown
e. Gate /Control None

HYDROMETEOROLOGICAL GAGES

a. Type None
b. Location N/A
c. Records None

MAXIMUM REPORTED NON-DAMAGING DISCHARGE None reported

HEC-1 DAM SAFETY VERSION
HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: Russellton Slurry Pond 3	NDI ID NO. PA 00839
Probable Maximum Precipitation (PMP)	24.0*
Drainage Area	0.15 sq. mi.
Reduction of PMP Rainfall for Data Fit	0.8 (24.0)
Reduce by 20%, therefore PMP rainfall =	19.2 inches
Adjustments of PMF for Drainage Area (Zone 7)	
6 hrs.	102%
12 hrs.	120%
24 hrs.	130%
48 hrs.	140%
Snyder Unit Hydrograph Parameters	
Zone	24**
C_p	0.45
C_t	1.6
L' =	0.19 mile
$t_p = C_t (L')^{0.6}$ =	0.59 hour
Loss Rates	
Initial Loss	1.0 inch
Constant Loss Rate	0.05 inch/hour
Base Flow Generation Parameters	
Flow at Start of Storm	1.5 cfs/sq.mi=0.23 cfs
Base Flow Cutoff	0.05 x Q peak
Recession Ratio	2.0
Overflow Section Data	None

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* Hydrometerological Report 33

**Hydrological Zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

ACKENHEIL & ASSOCIATES
GEO Systems, Inc.
1000 Banksville Road
PITTSBURGH, PA. 15216
(412) 531-7111

Job RUSSELLTON SLURRY POND 3 Job No. 5013FL
Subject DATA INPUT
Made By JPH Date 6/15/81 Checked JRB Date 6/22/81

LOSS RATE AND BASE FLOW PARAMETERS

As recommended by Corps of Engineers, Baltimore District

STRTL = 1 inch

CNSTL = 0.05 inch/hour

STRTQ = 1.5 cfs/mile^2

QRCSN = 0.05 (5% of Peak Flow)

RTIOR = 2.0

ELEVATION - STORAGE CAPACITY RELATIONSHIP.

From owner acquired topography, field inspection data and conversations with owners representative

AT elevation 1025 storage = 0

Elevation	Area (acres)	Δ V	Volume
1025			0
		23.3	
1050	2.8		23.3
		145.5	
1075	9.5		168.8
		425.7	
1100	25.9		594.5
		698.1	
1125	30.0		1292.6

$S	0.	23.3	168.8	594.5	1292.6
$E	1025.0	1050.0	1075.0	1100.0	1125.0

ACKENHEIL & ASSOCIATES
GEO Systems, Inc.
1000 Banksville Road
PITTSBURGH, PA. 15216
(412) 531-7111

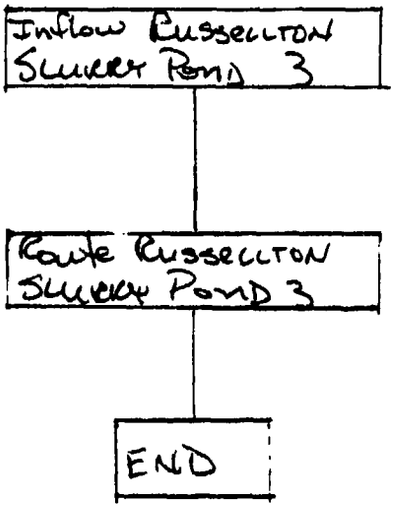
Job Russellton Slurry Pond 3 Job No. 80138L
Subject Data Input
Made By DH Date 6/18/81 Checked JFB Date 6/22/81

Overtop Parameters

Top of Dam elevation	1108.3
Length of Dam	850 feet
Coefficient of Discharge	3.09

Principal and Emergency Spillways Assumed inoperative
SLmax 956 SUmax 1115.0

Program Schedule



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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
    1              A1       NATIONAL PROGRAM FOR THE INSPECTION OF NON FEDERAL DAMS
    2              A2       HYDROLOGIC AND HYDRAULIC ANALYSIS OF RUSSELTON SLURRY POND 3
    3              A3       PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD
    4              B    300       0      10       0       0       0       0       0      -4       0
    5              B1     5
    6              J      1       2       1
    7              J1    1.      .5
    8              K      0       1                                       1
    9              K1       INFLOW HYDROGRAPH FOR RUSSELTON SLURRY POND 3
   10              M      1       1    0.15            0.15                                       1
   11              P             24.0     102     120     130     140
   12              T                                                1.0     .05
   13              W   0.59    0.45
   14              X   -1.5   -0.05     2.0
   15              K      1       2                                       1
   16              K1       ROUTING AT RUSSELTON SLURRY POND 3
   17              Y                                       1       1
   18              Y1     1                                                -1100.4
   19              $S     0.    23.3   168.8   594.5  1292.6
   20              $E  1025.  1050.  1075.  1100.  1125.
   21              $$1100.4  0.001    3.09     1.5
   22              $D1108.3    3.09     1.5    850.
   23              $L    10.   186.   339.   677.   806.   956.
   24              $V1108.3  1108.5  1109.  1110.  1112.  1115.
   25              K     99
   26              A
   27              A
   28              A
   29              A
   30              A

                        PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                RUNOFF HYDROGRAPH AT          1
                                ROUTE HYDROGRAPH TO           2
                                END OF NETWORK

**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE: 22 JUN 81
RUN  TIME: 11.15.25

                        NATIONAL PROGRAM FOR THE INSPECTION OF NON FEDERAL DAMS
                        HYDROLOGIC AND HYDRAULIC ANALYSIS OF RUSSELTON SLURRY POND 3
                        PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD

                                        JOB SPECIFICATION
                    NQ     NHR    NMIN    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
                   300       0      10       0       0       0       0       0      -4       0
                                       JOPER     NWT   LROPT   TRACE
                                           5       0       0       0

                                MULTI-PLAN ANALYSES TO BE PERFORMED
                                    NPLAN= 1 NRTIO= 2 LRTIO= 1
                            RTIOS=    1.00    0.50

          **********      **********      **********      **********      **********
```

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH FOR RUSSELTON SLURRY POND 3

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	0.15	0.0	0.15	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	24.00	102.00	120.00	130.00	140.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.05	0.0	0.0

UNIT HYDROGRAPH DATA

TP= 0.59 CP=0.45 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

UNIT HYDROGRAPH 33 END-OF-PERIOD ORDINATES, LAG= 0.59 HOURS, CP= 0.45 VOL= 1.00

10.	35.	62.	72.	65.	54.	45.	38.	32.	27.
23.	19.	16.	13.	11.	9.	8.	7.	6.	5.
4.	3.	3.	2.	2.	2.	1.	1.	1.	1.
1.	1.	0.							

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	26.88	24.46	2.42	14177.
										(683.)	(621.)	(61.)	(401.45)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTING AT RUSSELTON SLURRY POND 3

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.0	0.0	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	-1100.	0

CAPACITY=	0.	23.	169.	595.	1293.
ELEVATION=	1025.	1050.	1075.	1100.	1125.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1100.4	0.0	3.1	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1108.3	3.1	1.5	850.

CREST LENGTH AT OR BELOW ELEVATION	10.	186.	339.	677.	806.	956.
	1108.3	1108.5	1109.0	1110.0	1112.0	1115.0

PEAK OUTFLOW IS 0. AT TIME 50.00 HOURS
PEAK OUTFLOW IS 0. AT TIME 50.00 HOURS

********** ********** ********** ********** **********

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1	RATIO 2
				1.00	0.50
HYDROGRAPH AT	1	0.15	1	571.	286.
	(	0.39)	(	16.17)(	8.08)(
ROUTED TO	2	0.15	1	0.	0.
	(	0.39)	(	0.00)(	0.00)(

SUMMARY OF DAM SAFETY ANALYSIS

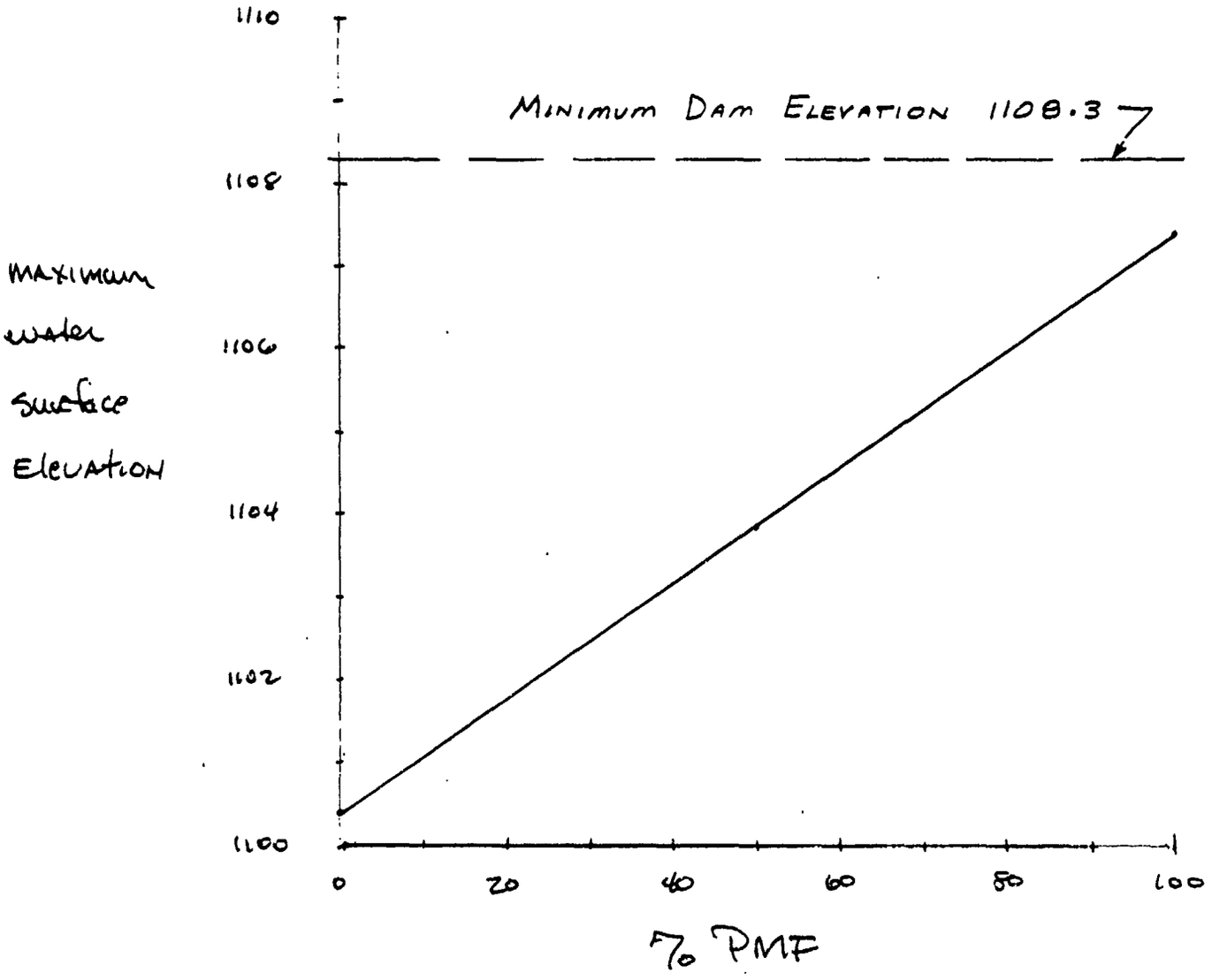
PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1100.40	1100.40	1108.30
STORAGE	606.	606.	826.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1107.37	0.0	800.	0.	0.0	50.00	0.0
0.50	1103.87	0.0	703.	0.	0.0	50.00	0.0

ACKENHEIL & ASSOCIATES
GEO Systems, Inc.
1000 Banksville Road
PITTSBURGH, PA. 15216
(412) 531-7111

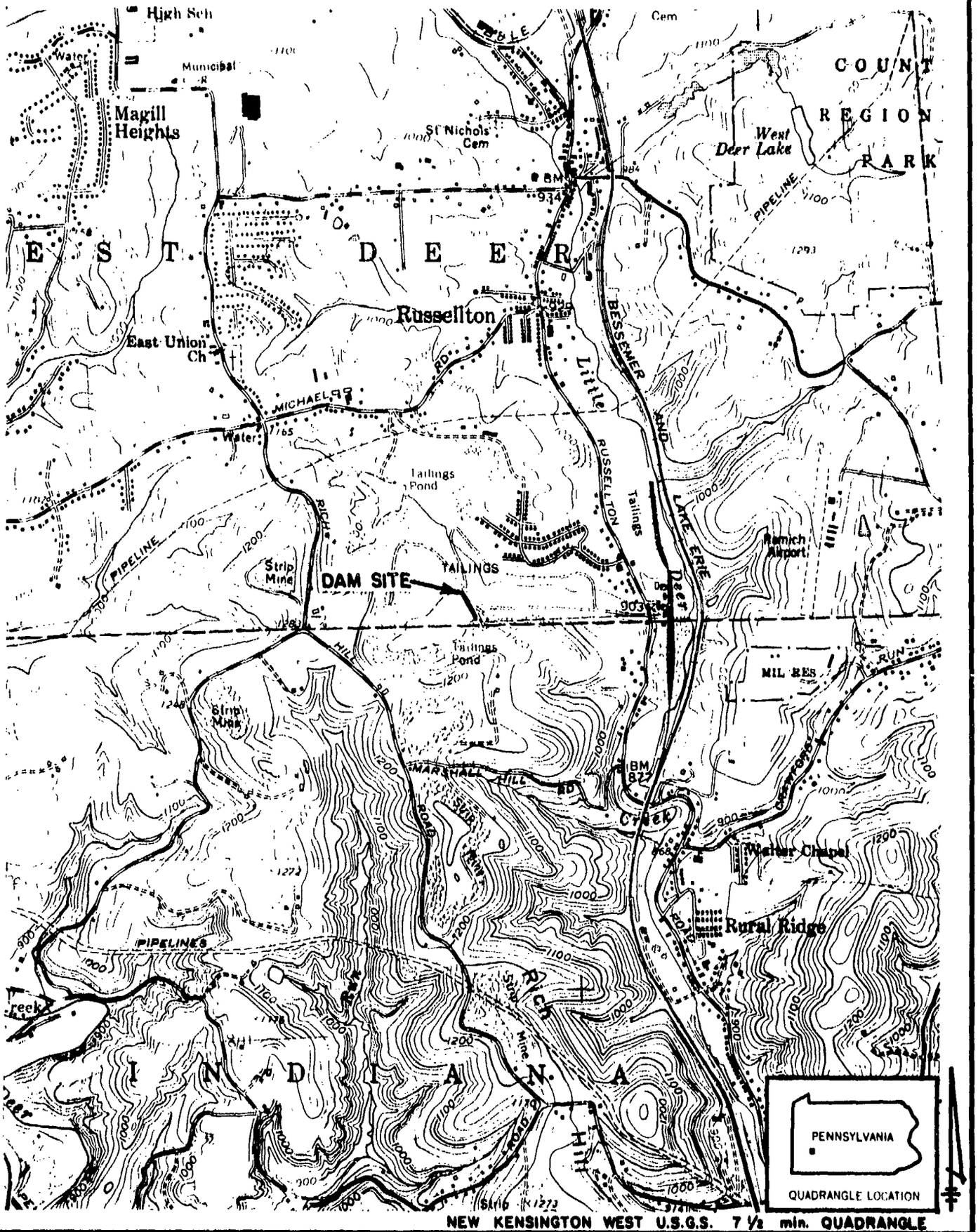
Job Russellton Slurry Pond 3 Job No. 80138C
Subject Hydrologic Performance Plot
Made By JPH Date 6/18/81 Checked JBB Date 6/22/81



APPENDIX E

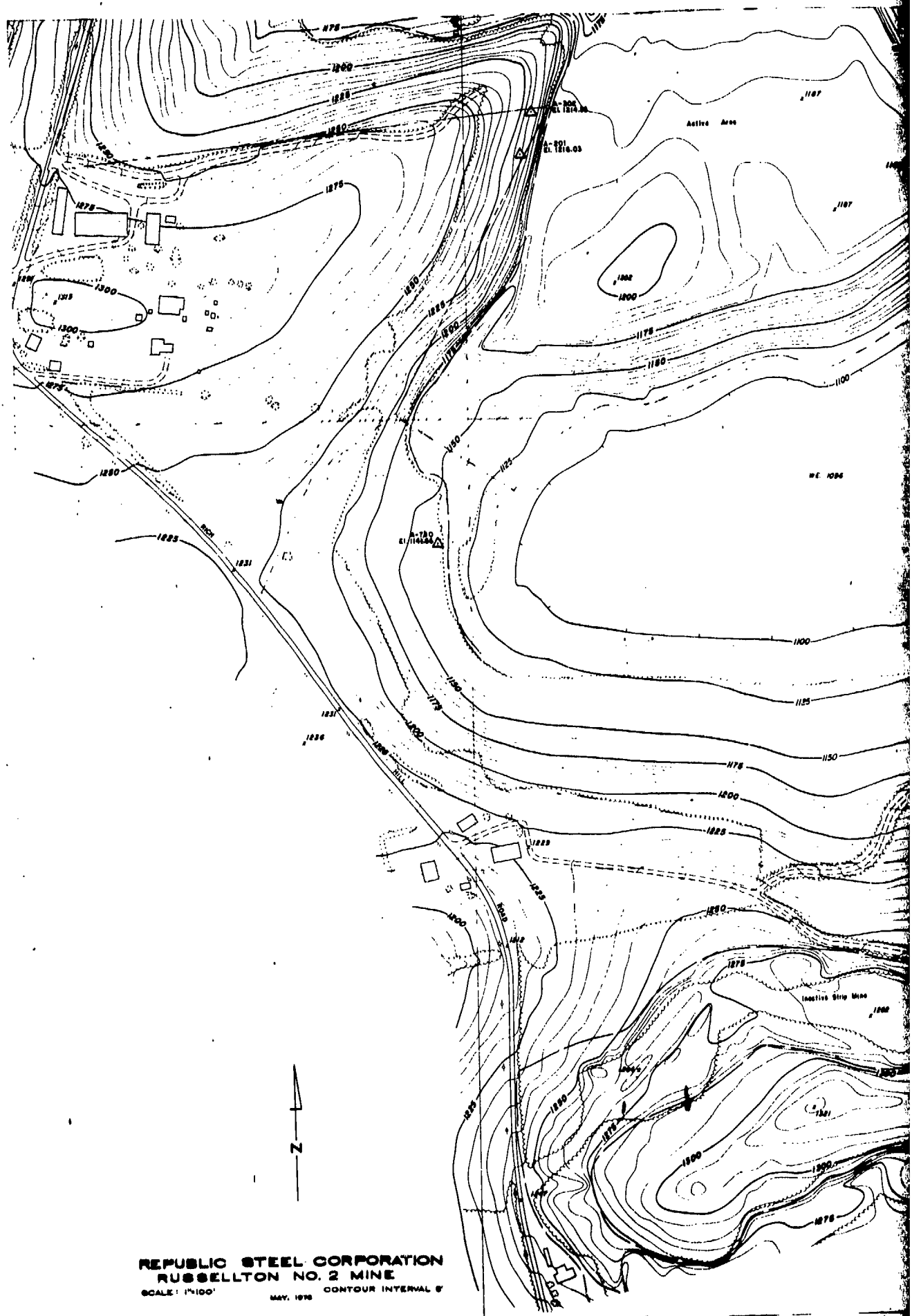
PLATES

LIST OF PLATES



NEW KENSINGTON WEST U.S.G.S. 7 ½ min. QUADRANGLE

DATE: JULY 1981	RUSSELLTON SLURRY POND 3 NATIONAL DAM INSPECTION PROGRAM	REGIONAL VICINITY MAP
SCALE: 1"=2000'		
DR: JF / CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD/PITTSBURGH, PA. 15216	
PLATE I		



REPUBLIC STEEL CORPORATION
RUSSELLTON NO. 2 MINE
SCALE: 1"=100' CONTOUR INTERVAL 5'
MAY, 1978

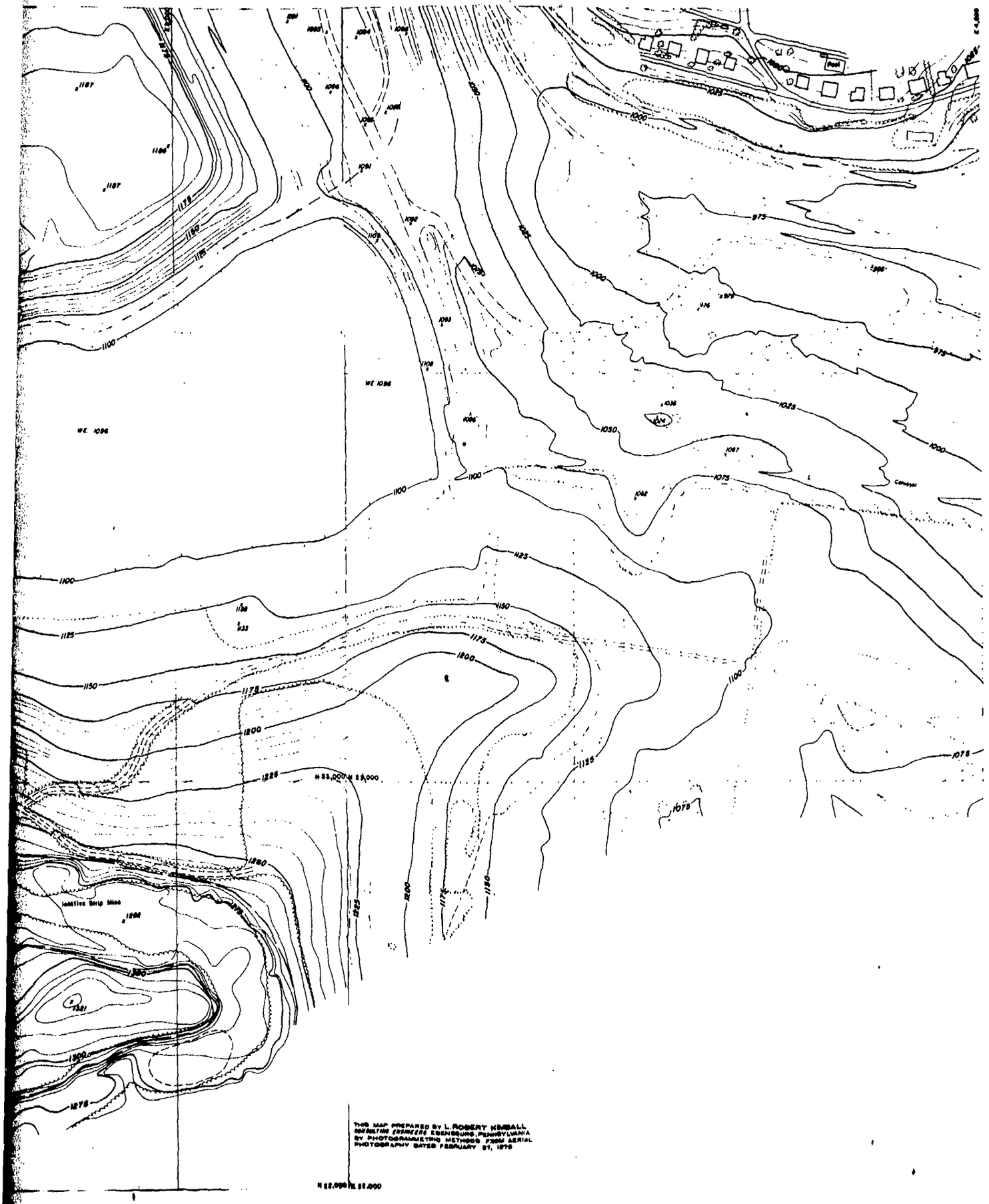

THIS MAP PREPARED BY L. ROBERT KIMBALL
CONSULTING ENGINEERS EBENSBURG, PENNSYLVANIA
BY PHOTOGRAMMETRIC METHODS FROM AERIAL
PHOTOGRAPHY DATED FEBRUARY 21, 1975

PLATE II

APPENDIX F

GEOLOGY

GEOLOGY

Geomorphology

Russellton Slurry Pond 3 is located within the Pittsburgh Plateau section of the Appalachian Physiographic Province. This region is characterized by gently folded sedimentary rocks which have been deeply cut by streams to form steep sided valleys. The dam is located on a small unnamed tributary to Little Deer Creek. Hilltops in this vicinity lie between elevations 1200 feet and 1300 feet. Relief between these rounded hilltops and Little Deer Creek is approximately 400 feet.

Structure

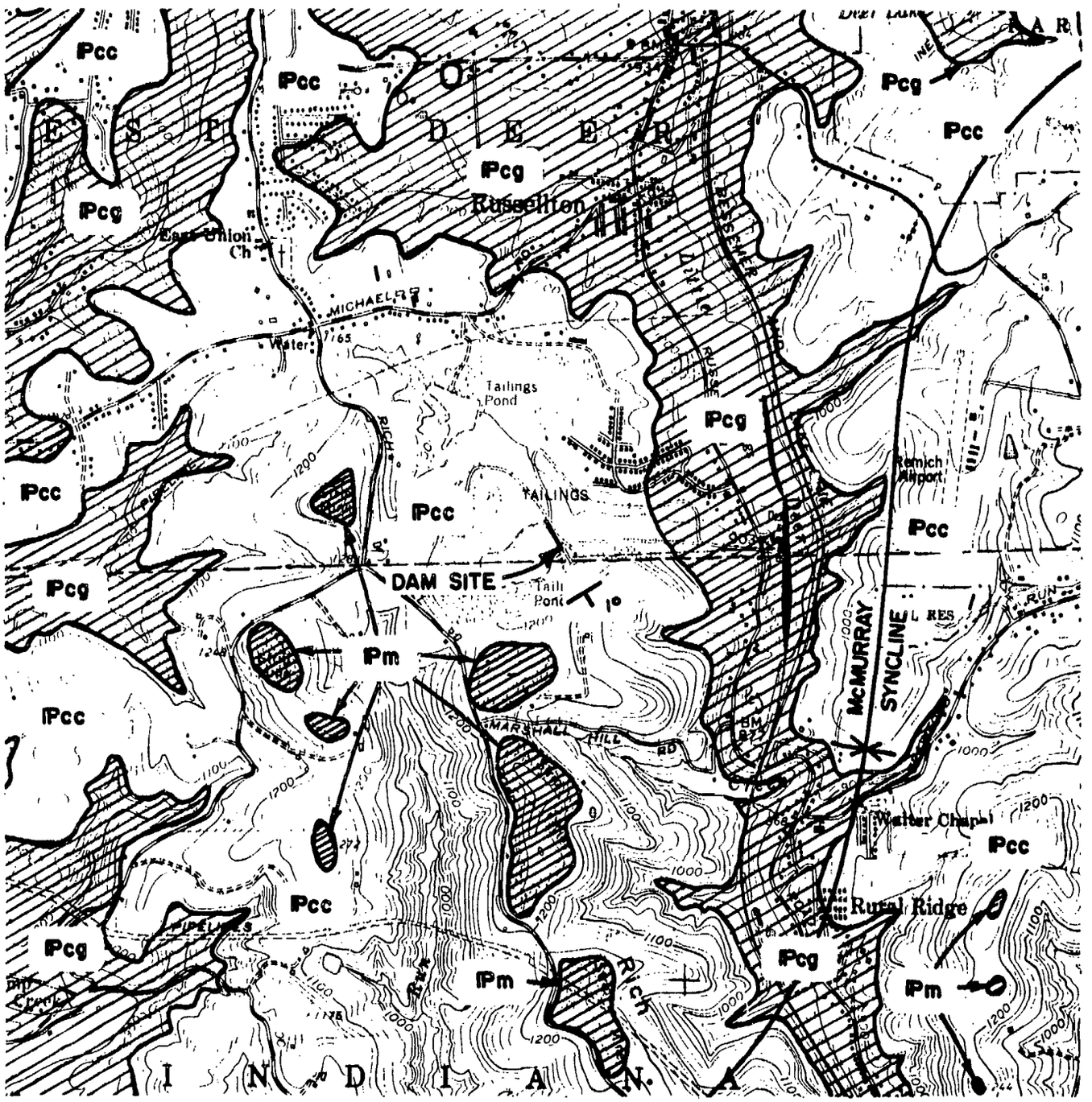
The site lies on the eastern flank of the McMurray Syncline, a northeast-southwest trending structure which plunges to the northeast. Rock strata in the vicinity of the dam dip to the southeast at a rate of about 1 degree. No major faulting has been documented in the area of the dam and no observations were made that would indicate faulting in the rocks outcropping around the site.

Stratigraphy

Rocks outcropping in the area of the dam belong to the Glenshaw, Casselman and Monongahela Formations which are all of Pennsylvanian Age. These formations consist of cyclic sequences of sandstone, shale, red beds, thin limestone and coal. The Ames Limestone, a highly fossiliferous marine limestone, marks the top of the Genshaw Formation, while the Pittsburgh Coal marks the bottom of the Monongahela Formation. A notable rock type in the Glenshaw and Casselman Formations is the landslide-prone red clayshale. Known locally as the "Pittsburgh Red Beds", these rock strata may be responsible for the ancient landslides common in this rock sequence.

Mining Activity

The Upper Freeport Coal seam lies approximately 400 feet beneath the dam and has been affected by deep mining. The Pittsburgh Coal Seam outcrops in the hilltops adjacent to the site and, for the most part, has been removed by strip mining.



NEW KENSINGTON WEST QUADRANGLE, ALLEGHENY COUNTY, PENNSYLVANIA

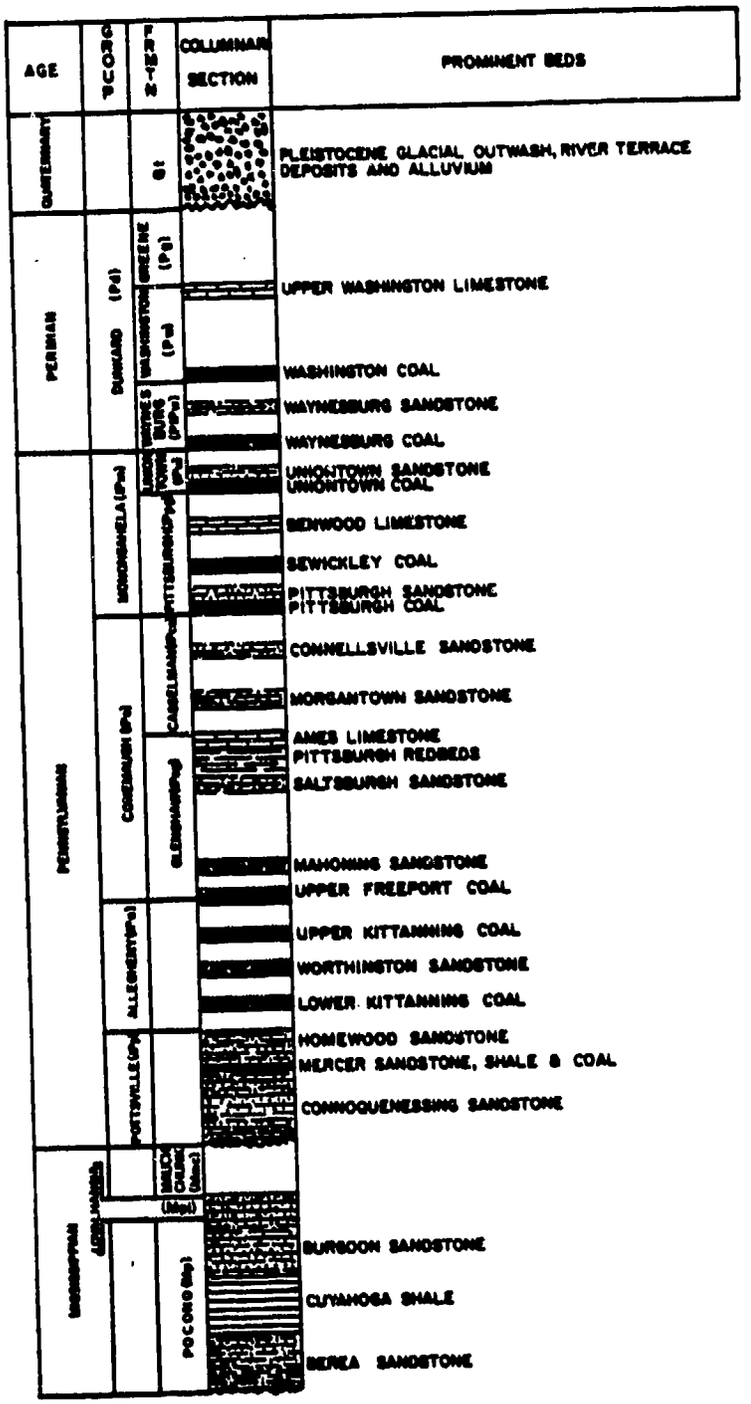
SCALE: 0 ½ MILE 1:24000

CONTOUR INTERVAL 20 FT. DATUM IS MEAN SEA LEVEL

——— FORMATION CONTACT

DATA OBTAINED FROM PENNSYLVANIA TOPOGRAPHIC AND GEOLOGIC SURVEY GREATER PITTSBURGH REGION GEOLOGIC MAP AND CROSS SECTIONS,1975 and GREATER PITTSBURGH REGION STRUCTURE CONTOUR MAP,1975

DATE: JULY 1981	RUSSELLTON SLURRY POND 3	GEOLOGIC MAP
SCALE: 1"=2000'	NATIONAL DAM INSPECTION PROGRAM	
DR: JF CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS	
	GEO SYSTEMS, INC.	
	1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	



DATE: JULY 1981	RUSSELLTON SLURRY POND 3 NATIONAL DAM INSPECTION PROGRAM	GEOLOGIC COLUMN
SCALE: 1"=360		
DR: JF CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	